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for:

Quality Assurance Checklist for Preparation of Data Sets from the ER Project Technical Database

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Quality Assurance Checklist for Preparation of Data Sets from the ER Project Technical Database

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Quality Assurance Checklist for Preparation of Data Sets from the ER Project Technical Database

Note: ER Project personnel may produce paper copies of this desk instruction (DI) printed from the controlled-document electronic file located at http://erinternal.lanl.gov/home_links/Library_proc.htm. However, it is their responsibility to ensure that they utilize and train to the current version of this procedure. Contact the author if text is unclear.

Note: The ER Project will not permit non-Project personnel access to electronic data or information with a network or on-line connection to the FIMAD unless an exceptional circumstance or need exists. Access to ER Project electronically-stored data in the FIMAD by non-Project personnel is addressed in the ER Project Directive E/ER:99-323, dated 02 November 1999, which is available on the ER Project world wide web homepage at http://erinternal.lanl.gov/home_links/Library_proc.htm.

1.0 PURPOSE

1.1 This DI states the responsibilities and describes the process for performing data quality assurance checks with regard to preparation of Environmental Restoration (ER) Project electronic data sets that are retrieved from the ER database (ERDB).

Note: This DI describes the quality assurance checks that are performed by the data stewards after retrieval of the data from the ERDB.

1.1.1 The ER Project data stewards in the Analysis and Assessments Focus Area have the primary responsibility for performing the quality assurance checks.

1.1.2 Electronic data sets that are prepared from the ERDB undergo standard quality assurance checks before they are available for reporting external to the ER Project.

Note: Instructions for retrieving data from the ER Project technical database are found in DI-4.10, Preparing Electronic Data Sets from the ER Project Technical Database. In addition, it is recommended that data stewards review DI-4.25, Generating Standard ER Project Data Table Formats Using MS Excel Tools, for instructions on producing formatted data tables for ER Project internal review and for external release.

1.2 Quality assurance checks are performed for both field-specific information (i.e., field data) and for analytical data (see Sections 2.2 and 2.9) to ensure the completeness, accuracy, and correctness of a data set.

1.2.1 Completeness means that all locations and samples associated with a site, as well as all the analytical data, were retrieved from the ERDB.

1.2.2 Accuracy means that the entries in the database are in agreement with available hardcopy records for both analytical and field data.

1.2.3 Correctness means that the data were reviewed to identify quality problems that impact the usability of the data for its intended purpose. For example, data sets prepared for site risk screening purposes should not include data for field screening, waste characterization, or quality control samples.

All electronic data sets prepared by a data steward must undergo internal review by at least one other data steward before delivery. (The ER Project focus area technical teams may perform additional quality assurance checks in the process of preparing a report.)

2.0 DEFINITIONS

2.1 *A3* — Acronym for Analysis and Assessment, the ER Project Focus Area responsible for the activities in this Desk Instruction.

2.2 *Analytical data* — Analytical data refers to the results that are reported by the analytical laboratories that the ER Project uses for chemical and/or physical analysis of samples.

2.3 *Authorizing individual* — An appropriate ER Project Management Team (PMT) member, Project Team Leader, Task Leader, or other authorized individual who has the authority to delegate data pulls from FIMAD.

2.4 *CDM* — Acronym for Centralized Data Management. CDM is the team within the Information Management Focus Area that is responsible for the upload of analytical and field data to the ERDB.

2.5 *Data Authenticator* — The individual responsible for comparing the electronic data record with the hardcopy record from the analytical laboratory and ensuring that they are in agreement.

2.6 *Data Steward* — A member of the Data Analysis and Assessment Team under the Analysis and Assessments Focus Area who is trained to this DI and is responsible for performing the tasks described in this DI.

2.7 *Data Validator* — An ER Project chemist trained to evaluate analytical chemistry data as per SOPs 15.01-15.07.

2.8 *ERDB* — Acronym for ER Project database.

2.9 *Field-specific information* — Field-specific information, or field data, refers to data about the sampling location, as well as information about the sample itself, such as matrix, depth, and date of collection.

2.10 *Frequency of Detect (FD) table* — A data table that summarizes the analytical data for a group of samples, including the comparison of the analytical data with LANL-specific background values (for inorganics and radionuclides) or detected chemicals (for organics).

2.11 *LOCATION_ID* — The unique identifier corresponding to a specific location, usually further defined by state plane coordinates (x, y, and z coordinates).

2.12 *PRS* — Acronym for Potential Release Site, a spatial and/or regulatory definition for a potentially contaminated area.

2.13 *Requesting individual* — An appropriate Project Management Team (PMT) member, field team leader, risk assessor, or other authorized individual who demonstrates a specific need to evaluate a particular data set from the ER Project technical database.

2.14 *RFI* — RCRA Facility Investigation

2.15 *RFI_Class* — The classes of chemical constituent, including organic, inorganic, and radionuclide.

2.16 *RFI Report* — RCRA Facility Investigation report; a standard ER Project deliverable that adheres to the RFI Annotated Outline found online at: http://erinternal.lanl.gov/home_linkd/Library_doctemp.htm.

2.17 *Sample Collection Log (SCL)* — A form that is initiated by CDM and completed by the field team at the time that a sample is collected (see SOP-1.04). The SCL contains information about the sample, such as matrix, depth, and date of collection.

2.18 *Sample_ID* — The unique identifier corresponding to a particular sample.

2.19 *Samples Taken Table* — A table that lists the locations, samples, request numbers, and analytical suites associated with a PRS or group of PRSs.

2.20 *TCLP* — Toxicity Characteristic Leaching Procedure

3.0 RESPONSIBLE PERSONNEL

The following personnel are responsible for activities identified in Section 4.0 of this DI:

3.1 Centralized Data Management

3.2 Data Authenticator

3.3 Data Steward

3.4 Data Validator

4.0 PROCEDURE

4.1 Members of the **ER Project Information Management team** perform the following quality assurance checks on analytical and field data before the data stewards retrieve the electronic data from the ERDB.

4.1.1 All analytical data received since April 1995 undergo routine validation by qualified **data validators** (see SOPs –15.1 through 15.7). (The results of routine validation are data quality flags and explanatory reason codes that are associated with an individual analytical result.)

4.1.2 **Data authenticators** input to the ERDB the data quality flags and reason codes.

4.1.3 **Data authenticators** authenticate the electronic records for all analytical data received since April 1995 by comparison with the hardcopy analytical data package (see DI-4.8, Analytical Data Authentication Work Process); errors in the electronic record are corrected manually.

4.1.4 **CDM** manually enters field data for samples collected since 1997 from Sample Collection Logs provided by the field team; CDM personnel ensure that the field data are accurately transcribed from the SCLs.

Note: The type of sample information that the ER Project retains in the ERDB and the quality assurance processes that the data are subjected to, have changed over time since the ERDB was initiated in 1990. Therefore, some types of information may be absent or incomplete for older samples, or may be inaccurate because strict quality assurance processes were not in place in earlier years.

4.2 The **data steward** retrieves the electronic data from the ERDB to create a monolith table, referred to as the "All Analyses" table. (Retrieval of the electronic data is described in DI-4.10, Preparing Electronic Data Sets from the ER Project Technical Database; the data dictionary for the All Analyses table is included in Attachment A.)

Note: This DI refers to checks that are performed for specific data fields that are in the All Analyses table. The quality assurance checks are performed using Microsoft Access to query the values contained in specific data fields.

4.3 The **data steward** performs quality assurance checks on the All Analyses table for the field data (see Section 4.5) and the analytical data (see Section 4.6) to prepare the electronic data set for screening assessment calculations.

Note: Certain fields in the electronic data set must be complete and accurate so that the ER Project custom software that performs the screening assessment calculations will execute successfully. The data calculations

and some of the quality assurance checks were automated using Microsoft Access custom tools that are described in DI-4.10.

4.4 The **data steward** reviews, as an important quality assurance check, data summaries in the FD tables (see Section 4.7) to identify potential data quality issues that are included in this Desk Instruction. (The output of the screening assessment calculations includes the Frequency of Detect (FD) tables for each RFI class [e.g., inorganic, radionuclide, and organic].)

Note: Data are never *deleted* from the data set; rather, the data steward uses queries to remove unwanted records from the All Analyses table and places them in a new table in the Access database.

4.5 Quality Assurance Checks for Field Data

The sample information that the ER Project collects in the field is subject to change over time. For example, some sites were excavated or otherwise remediated. This has led to changes in the database, such as the inclusion of an "excavated" flag that did not exist when the sample was first analyzed. Thus, some types of information may not be present in the ERDB for older samples and must be assigned and evaluated at the time of assessment.

4.5.1 The **data steward** ensures that all the locations and samples associated with a particular potential release site (PRS) or other site (e.g., canyon reach or well) were identified. This evaluation is made using one or more of the following processes:

- Perform multiple queries against the database to retrieve data based on criteria for values in LOCATION_ID, SAMPLE_ID, TA, or PRS_ID; compare the results of the queries to check for inconsistencies. (See DI-4.10 for a more complete description of this process.)
- Review a map of the general area and evaluate locations at and/or near the site. (Note that many of the PRS boundaries in the ER Project spatial files are not updated to reflect sampling activities.)
- Communicate with the ER Project team leader and/or technical team responsible for the site to obtain Location ID and/or Sample ID lists.

4.5.2 The **data steward** checks, at a minimum, the fields in the All Analyses table described in the table below.

Note: Accurate values are required for the data fields listed in the table below before the data set can undergo screening assessment calculations. Acceptable documentation for providing an update to field data includes field logbooks, sample collection logs, and, for missing or incomplete fields such as media code and/or excavation

status, knowledgeable subject-area experts and maps. In addition, lookup tables of standardized values for certain fields are maintained in the ERDB (see the Data Dictionary in Attachment A).

Note: The All Analyses table may be reviewed for erroneous or missing field data by querying in the Access database for distinct combinations of PRS_ID, LOCATION_ID, SAMPLE_ID, SAMPLE_COMMENTS, and the fields listed below.

Field in All Analyses Table	Quality Assurance Operation
EXCAV_FLAG	Identify and remove from the All Analyses table records for samples excavated in a remedial action (EXCAV_FLAG=Y). (This field is dynamic in the database and may need verification by checking the hardcopy cleanup report.)
SAMPLE_USG_CODE	Identify and remove from the All Analyses table records for samples that were collected solely for the purpose of waste characterization, health and safety, field screening, or background characterization.
FIELD_PREP	For water samples, verify the field preparation of either filtered or nonfiltered by checking the Sample Collection Log.
BEGIN_DEPTH	The begin depth, if present, should be less than the end depth. If no depth is present, the reviewer must establish whether a valid depth is available for the sample.
END_DEPTH	The end depth, if present, should be greater than the begin depth. If no depth is present, the reviewer must establish whether a valid depth is available for the sample.
DEPTH_UNITS	Standardize the depth units to feet.
FLD_MATRIX_CODE	Review values for the field matrix code for agreement with the EVAL_CLASS and the analytical reporting units.

Field in All Analyses Table	Quality Assurance Operation
EVAL_CLASS	Review values for the sample evaluation class. If absent, assign the evaluation class in order to perform comparisons with background values (see SOP-15.12 and SOP-15-13).
FIELD_QC_TYPE_CODE	Use the Access custom tools to identify and remove from the All Analyses table records for field quality control samples (e.g., blanks, rinsates, field spikes)

4.5.3 The **data steward** assigns the DECISION_SET values in the All Analyses table, based on the data reporting requirements of the data requestor.

4.6 Quality Assurance Checks for Analytical Data

The quality assurance checks should usually be performed in the order presented.

4.6.1 After the All Analyses table is created, the **data steward** links its unique set of sample IDs to the FIMAD.SMO_REQUEST_COC table to check that all the data for the analytical tests originally ordered were returned by the analytical laboratory and uploaded to the ERDB.

Note: The FIMAD.SMO_REQUEST_COC only tracks analytical requests submitted since April 1995. If no analytical data are found for a sample collected before April 1995, the data steward works with the responsible Team Leader to determine what, if any, analytical data should be available for that sample.

4.6.2 The **data steward** reviews the STD_SAMPLE_VALUE, STD_REPORTING_UNITS, and STD_UNCERTAINTY (for radionuclide results only) fields for Null values.

4.6.3 If Null values are found, the **data steward** performs the necessary unit conversion using the values found in SAMPLE_VALUE, REPORTING_UNITS, and UNCERTAINTY to populate the standardized fields in the All Analyses table.

4.6.4 The **data steward** converts tritium results for soil and rock samples that have STD_REPORTING_UNITS = pCi/mL or pCi/L (or REPORTING_UNITS = pCi/mL or pCi/L if STD_REPORTING_UNITS is Null) to units of pCi/g (STD_REPORTING_UNITS = pCi/g). (The percent moisture value for the sample must be obtained, either by checking for an analytical result for percent moisture

(ANALYTE_NAME = “Percent Moisture” or “Unbound Water”), or checking the PERCENT_MOISTURE field.)

Note: The equation for conversion of tritium values is found in SOP-15.13, Performing Background Comparisons for Radionuclides. If the percent moisture value is not available, the conversion cannot be performed.

4.6.5 The **data steward** checks the values in the ANALYTE_CODE field to ensure that results for laboratory quality control samples are not misidentified as sample results. (A list of analyte names that are associated with quality control samples is included in Attachment B.)

4.6.6 The **data steward** uses the Access custom tools to check for mismatched values in MATRIX and REPORTING_UNITS; e.g., water samples reported with soil units of measurement; mismatched values are resolved by checking the hardcopy records.

Note: The results for Toxicity Characteristic Leaching Procedure (TCLP) analyses for soil samples are returned in units of mg/L as required by SW-846 Method 1311. (Checking the values in the ANALYSIS_METHOD or SUITE_NAME fields may identify TCLP results.)

4.6.7 The **data steward** uses the Access custom tools to remove the screening-level analytical results produced by mobile laboratories from the All Analyses table and moves them to a separate table in the Access database. (Checking values in the LAB_NAME, ORDER_CODE, SUITE_NAME fields may identify mobile laboratory results.)

Note: The ER Project used mobile laboratories for screening samples in the mid-1990s. The mobile-laboratory data were uploaded to the ERDB in the same tables that contain fixed-laboratory results. The mobile laboratory results are not of the same pedigree as fixed-laboratory results because a different level of quality was applied to the analyses in exchange for a quicker turnaround on analytical results. The difference may have been in modifications to analytical methods or abbreviated quality control procedures. These differences mean that the mobile laboratory data cannot be compared directly with the fixed-lab data.

4.6.8 The **data steward** checks data sets for redundant or missing analytical records.

Note: Redundant records occur when multiple uploads of the same record occur. Missing records arise when the original upload was faulty or reporting by the analytical laboratory was erroneous.

The following is a table identifying possible reasons for redundant records. Some require review by a chemist for a decision as to which records should remain with the data set through data assessment and which records should be moved to another table.

REASON	EXPLANATION
ORIGINAL AND DILUTION	WHEN A REDUNDANT RECORD IS CAUSED BY A DIFFERENT DILUTION ANALYSIS OF A SAMPLE.
RE-ANALYZED	WHEN A REDUNDANT RECORD IS CAUSED BY A DIFFERENT ANALYSIS_DATE.
TWO MATRICES LISTED	TWO MATRICES ARE LISTED IN THE LABORATORY DATA.
COMBINATION REDUNDANT RECORD	RECORD IS ALMOST A COMPLETE REDUNDANT RECORD, BUT SOME COMBINATION OF FIELDS ARE NOT CONSISTENT FROM ONE TO THE NEXT.
TWO VALUES	TWO RESULTS FOR SAME ANALYSIS, REST OF RECORD IS REDUNDANT.
TWO SOURCE FILES	WHEN A REDUNDANT RECORD IS CAUSED BY A DIFFERENT SOURCE FILE. REVIEW ALL SEQ_NUMs BECAUSE FILE NAMES CAN REPRESENT METHODS RUN.
RE-REPORTED @ LATER DATE	WHEN THE REDUNDANT RECORD IS CAUSED BY A DIFFERENT REF_DOC VALUE, MEANS IT WAS RE-REPORTED.
RE-LOADED @ LATER DATE	WHEN THE REDUNDANT RECORD IS CAUSED BY A DIFFERENT LOAD DATE, MEANS THE DATA WAS RE-LOADED.
TRUE REDUNDANT RECORD	WHEN A REDUNDANT RECORD IS CAUSED BY ONLY A DIFFERENT AHID OR SEQ_NUM. RETAIN THE LOWEST SEQ_NUM AND MOVE THE OTHER SEQ_NUMs OUT OF ALL ANALYSES.
MULTIPLE CONTAINERS RUN	WHEN A REDUNDANT RECORD IS CAUSED BY A DIFFERENT LAB_SAMPLE_ID, CONTAINER_ID, OR COMMENT CONCERNING A CUT OR CONTAINER NUMBER.

REASON	EXPLANATION
TWO METHODS OR TECHNIQUES RUN	WHEN A REDUNDANT RECORD IS CAUSED BY A DIFFERENT ANALYSIS_METHOD OR TECHNIQUE_CODE.
ORIGINAL AND REVAL	WHEN A REDUNDANT RECORD IS CAUSED BY A RE-EVALUATION OF A SAMPLE.
METTAL AND METTCLP RUN	WHEN A REDUNDANT RECORD IS CAUSED BY A SAMPLE HAVING BOTH A STANDARD METAL ANALYSIS AND A TCLP ANALYSIS.

4.6.9 The **data steward** uses the Access custom tools to review the analytical data records for diluted (DILUTION FACTOR <> 1) and/or reanalyzed (SAMPLE_TYPE_CODE = “REVAL”) samples. See Attachment C, Evaluation of Reanalyzed and Diluted Sample Results, for a description of the algorithm used to evaluate the analyte results. (The appropriate records are retained in the All Analyses table; unused records are moved to a separate table in the Access database.)

4.6.10 The **data steward** uses the Access custom tools to assign a value to the ANALYTICAL_SUITE field in the All Analyses table. (The ANALYTICAL_SUITE field is not derived from the ERDB; it is a calculated field that is populated by the data steward. The ANALYTICAL_SUITE field is required for assigning the focused validation qualifier [see Section 4.6.12 below].)

4.6.11 The **data steward** reviews and assigns, as necessary, a value to the RFI_CLASS field in the All Analyses table. (The RFI_CLASS field is obtained from the ERDB but may be incomplete.)

4.6.12 The **data steward** uses the Access custom tools to assign focused validation values to the RFI_QUAL and RFI_REASON fields in the All Analyses table. (The RFI_QUAL and RFI_REASON fields are not derived from the ERDB; they are calculated fields that are populated by the data steward.)

Note: The focused validation flag is assigned by evaluating together the qualifier flags applied by the analytical laboratory (LAB_QUALIFIER) and the ER Project routine validation process (LANL_QUALIFIER and LANL_QUALIFIER_REASON). (These fields are maintained in separate tables in the ERDB.) Both the analytical laboratory qualifier flag and the validation flag must be evaluated to establish the detect status of the analyte. The focused validation flag provides a unified

field that indicates the detect status of the analyte, as well as any particular data quality issues.

4.6.13 The **data steward** removes records for rejected analytical results (RFI_QUAL = “R”) from the All Analyses table and moves them to a separate table in the Access database.

4.6.14 The **data steward** uses the Access custom tools to remove gamma-emitting analytes from the All Analyses table that are not reliably measured by gamma spectroscopy, as described in *Approach to Gamma Spectroscopy Data Quality Evaluation* (LA-UR-00-1088, ER2000-0061, March 2000).

4.6.15 The **data steward** uses the Access custom tools to remove radionuclide results obtained by gamma spectroscopy from the All Analyses table if a result was also obtained using a more reliable method (usually alpha spectrometry); for example, Am-241 and U-235 are included in the ER Project gamma spectroscopy suite, but these analytes are often also analyzed by alpha spectrometry, which is more sensitive than gamma spectroscopy.

4.7 Quality Assurance Checks Using the Frequency of Detect Table

4.7.1 The **data steward** creates a Frequency of Detect (FD) table (see example in Attachment D) for each RFI class (inorganic, radionuclide, and organic) using the Microsoft Access custom tools described in DI-4.10.

Note: The FD table review requires a greater level of expertise and experience on the part of the data steward than the quality assurance checks described in the previous sections of this Desk Instruction.

4.7.2 The **data steward** reviews the “Analyte” column to check for missing analytes (e.g., fewer than 23 metals, or one of the three uranium isotopes absent).

4.7.3 The **data steward** reviews the “Number of Analyses”" column to check for missing analytical results; for example, one metal analyte may have fewer analytical results than all the other metals.

4.7.4 The **data steward** reviews the minimum and maximum values for detected and nondetected results for anomalous results (very low or very high values). (Anomalous results are subjected to additional focused validation checks that usually include verification with hardcopy records.)

5.0 RECORDS

No records are generated by this desk instruction.

6.0 TRAINING

All users of this DI are trained by reading this DI; documentation of training is not necessary.

7.0 ATTACHMENTS

Attachment A: Data Dictionary for the “All Analyses” Table (7 pages)

Attachment B: Quality Control Analytes (2 pages)

Attachment C: Evaluation of Reanalyzed and Diluted Sample Results (1 page)

Attachment D: Example Excel Output File in Frequency of Detect Format (for Soils and Sediments) (1 page)

Data Dictionary for the "All Analyses" Table

FIELD NAME	DATA TYPE	SOURCE DATABASE TABLE	DICTIONARY DESCRIPTION
ANALYSIS_DATE	DATE	FIMAD.ANYL	The date (and time, if available) of analysis of this aliquot of the sample, as reported by the analytical laboratory.
ANALYSIS_METHOD	VARCHAR2(50)	FIMAD.ANYL	The analytical method provided by the analytical laboratory as being used to analyze the sample. This field may include the method source (e.g. SW-846) and method number (e.g. 6010B), or it may include the analytical laboratory internal standard operating procedure.
ANALYTE_CODE	VARCHAR2(50)	FIMAD.ANYL	The code for the analyte assigned by LANL. In the case of organic compounds, it is the CAS number. In the case of radionuclides, elements, or inorganic compounds, it is the chemical symbol. In the case of non-chemical analytes, it is an abbreviation of the analyte name.
ANALYTE_NAME	VARCHAR2(100)	FIMAD.EDD_ANALYTE_CODE_LIST	The name of the analyte that corresponds to the CAS number, chemical symbol, or property measured. (This field maps to ANALYTE_CODE_DESC in FIMAD.EDD_ANALYTE_CODE_LIST.)
ANYL_COMMENTS	VARCHAR2(120)	FIMAD.ANYL	Free text comments about an analytical result provided by the analytical laboratory.
BEGIN_DEPTH	NUMBER	DATADM.SAMPLE_DETAIL	The top of the depth interval sampled. (This field maps to TOP_DEPTH in DATADM.SAMPLE_DETAIL)
COLLECTION_DATE	DATE	DATADM.SAMPLE_DETAIL	The date and time during which this sample was obtained. (This field maps to START_DATE_TIME in DATADM.SAMPLE_DETAIL.)
COMPOS_TYPE_CODE	VARCHAR2(10)	DATADM.SAMPLE_HDR	A code associated with a valid composite type for a sample. See LUT_COMPOS_TYPE for a list of allowed values.
COMPOS_TYPE_CODE_QC	VARCHAR2(6)	FIMAD.SAMPLE_QC_CONTROL	A value that represents the current quality status of the value in the COMPOS_TYPE_CODE field, based on global database quality checks. See LUT_SAMPLE_QC_CODE for a list of possible values.
CONTAINER_ID	VARCHAR2(50)	FIMAD.ANYL	The unique identifier assigned by LANL to a container as part of a sample since April 1995. Multiple containers may make up an individual sample.

FIELD NAME	DATA TYPE	SOURCE DATABASE TABLE	DICTIONARY DESCRIPTION
DECISION_SET	VARCHAR2(50)	N/A	The identifier, for grouping purposes, used to define the data set. The DECISION_SET field is not contained in the database; it is inserted and defined by the LANL data steward responsible for preparing the data set.
DEPTH_UNITS	VARCHAR2(10)	DATADM.SAMPLE_DETAIL	The unit of measure in which the depth is presented. (This field maps to DEPTH_UOM in DATADM.SAMPLE_DETAIL.)
DILUTION_FACTOR	NUMBER	FIMAD.ANYL	The overall dilution of this sample aliquot, as reported by the analytical laboratory. A value of one should correspond to nominal conditions for the method. Values greater than one indicate the sample aliquot was diluted for analysis. Values less than one indicate that the sample aliquot was concentrated for analysis.
END_DEPTH	NUMBER	DATADM.SAMPLE_DETAIL	The bottom of the depth interval sampled. (This field maps to BOTTOM_DEPTH in DATADM.SAMPLE_DETAIL.)
EVAL_CLASS	VARCHAR2(20)	DATADM.SAMPLE_HDR	A code associated with a valid evaluation class to which a sample may be assigned for the purpose of data analysis and assessment. See LUT_EVAL_CLASS for a list of possible values.
EVAL_CLASS_CODE_QC	VARCHAR2(6)	DATADM.SAMPLE_QC_CONTROL	A value that represents the current quality status of the EVAL_CLASS_CODE, based on global database quality checks. See LUT_SAMPLE_QC_CODE for a list of possible values.
EXCAV_FLAG	VARCHAR2(5)	DATADM.SAMPLE_HDR	A flag that identifies if the environmental medium from which the sample was collected has since been excavated. The possible values are Yes, No, and Null.
EXCAV_FLAG_QC	VARCHAR2(6)	FIMAD.SAMPLE_QC_CONTROL	A value that represents the current quality status of the EXCAV_FLAG, based on global database quality checks. See LUT_SAMPLE_QC_CODE for a list of possible values.
FIELD_PREP	VARCHAR2(20)	DATADM.SAMPLE_HDR	Preparation of the sample, done in the field, prior to sending it to an analytical laboratory. See LUT_FLD_PREP for a list of possible values. (This field maps to FLD_PREP_CODE in DATADM.SAMPLE_HDR.)

FIELD NAME	DATA TYPE	SOURCE DATABASE TABLE	DICTIONARY DESCRIPTION
FIELD_QC_TYPE_CODE	VARCHAR2(20)	DATADM.SAMPLE_HDR	A code associated with a quality control (QC) sample type submitted by the sampling organization. See LUT_FLD_QC_TYPE for a list of possible values. A NULL value represents a non-QC sample.
FLD_MATRIX_CODE	VARCHAR2(10)	DATADM.SAMPLE_HDR	A code associated with the sample matrix as perceived by the field person. See LUT_FLD_MATRIX for a list of possible values.
FLD_MATRIX_CODE_QC	VARCHAR2(6)	DATADM.SAMPLE_QC_CONTROL	A value that represents the current quality status of the FLD_MATRIX_CODE, based on global database quality checks. See LUT_SAMPLE_QC_CODE for a list of possible values.
FLD_PREP_CODE_QC	VARCHAR2(6)	DATADM.SAMPLE_QC_CONTROL	A value that represents the current quality status of the FLD_PREP_CODE, based on global database quality checks. See LUT_SAMPLE_QC_CODE for a list of possible values.
FLD_QC_TYPE_CODE_QC	VARCHAR2(6)	DATADM.SAMPLE_QC_CONTROL	A value that represents the current quality status of the FLD_QC_TYPE_CODE, based on global database quality checks. See LUT_SAMPLE_QC_CODE for a list of possible values.
LAB_NAME	VARCHAR2(50)	FIMAD.LAB_CODE_LIST	The name of the analytical laboratory that performed the analysis on the sample and provided the analytical data.
LAB_QUALIFIER	VARCHAR2(20)	FIMAD.ANYL	A string of single letter result qualifiers assigned by the analytical laboratory, based on defined rules and values.
LANL_QUALIFIER_1	VARCHAR2(20)	FIMAD.LANL_QUALIFIERS	A string of single letter result qualifiers assigned by LANL, based on defined rules and values. Multiple LANL qualifiers may be assigned to one result. See LUT_LANL_QUALIFIER for a list of possible values.
LANL_QUALIFIER_2	VARCHAR2(20)	FIMAD.LANL_QUALIFIERS	A string of single letter result qualifiers assigned by LANL, based on defined rules and values. Multiple LANL qualifiers may be assigned to one result.
LANL_QUALIFIER_3	VARCHAR2(20)	FIMAD.LANL_QUALIFIERS	A string of single letter result qualifiers assigned by LANL, based on defined rules and values. Multiple LANL qualifiers may be assigned to one result.

FIELD NAME	DATA TYPE	SOURCE DATABASE TABLE	DICTIONARY DESCRIPTION
LANL_QUALIFIER_4	VARCHAR2(20)	FIMAD.LANL_QUALIFIERS	A string of single letter result qualifiers assigned by LANL, based on defined rules and values. Multiple LANL qualifiers may be assigned to one result.
LANL_QUALIFIER_REASON_1	VARCHAR2(20)	FIMAD.LANL_QUALIFIERS	A code that is assigned to the reason for the corresponding LANL qualifier, based on defined rules and values. If multiple LANL qualifiers are assigned to one result, there will be a corresponding reason code for each qualifier. See LUT_LANL_QUALIFIER_REASON for the descriptions of reason codes.
LANL_QUALIFIER_REASON_2	VARCHAR2(20)	FIMAD.LANL_QUALIFIERS	A code that is assigned to the reason for the corresponding LANL qualifier, based on defined rules and values. If multiple LANL qualifiers are assigned to one result, there will be a corresponding reason code for each qualifier. See LUT_LANL_QUALIFIER_REASON for the descriptions of reason codes.
LANL_QUALIFIER_REASON_3	VARCHAR2(20)	FIMAD.LANL_QUALIFIERS	A code that is assigned to the reason for the corresponding LANL qualifier, based on defined rules and values. If multiple LANL qualifiers are assigned to one result, there will be a corresponding reason code for each qualifier. See LUT_LANL_QUALIFIER_REASON for the descriptions of reason codes.
LANL_QUALIFIER_REASON_4	VARCHAR2(20)	FIMAD.LANL_QUALIFIERS	A code that is assigned to the reason for the corresponding LANL qualifier, based on defined rules and values. If multiple LANL qualifiers are assigned to one result, there will be a corresponding reason code for each qualifier. See LUT_LANL_QUALIFIER_REASON for the descriptions of reason codes.
LIMIT	NUMBER	FIMAD.ANYL	A value that represents the limit for the analytical measurement, as described in the LIMIT_TYPE field, as reported by the analytical laboratory for radionuclide results received since April 1995.
LIMIT_TYPE	VARCHAR2(20)	FIMAD.ANYL	A description of the type of limit reported in the LIMIT field, as reported by the analytical laboratory for radionuclide results received since April 1995.

FIELD NAME	DATA TYPE	SOURCE DATABASE TABLE	DICTIONARY DESCRIPTION
LOCATION_ID	VARCHAR2(20)	DATADM.LOCATION_HDR	A unique identification number assigned to a specific location that may have corresponding x- and y- coordinates. The format is represented by TA-NNNNN. (This field maps to LOCATION_NAME in DATADM.LOCATION_HDR.)
MATRIX	VARCHAR2(20)	FIMAD.ANYL	A description of the sample matrix as reported by the analytical laboratory.
PERCENT_MOISTURE	NUMBER	FIMAD.ANYL	Percent of sample composed of water, as reported by the analytical laboratory. Percent moisture may be listed in this field or it may be listed as an individual analyte with the result being listed in the SAMPLE_VALUE field.
PRS_NAME	Text	N/A	The text name of a PRS. The PRS_NAME field is not contained in the database; it is inserted by the LANL data steward responsible for preparing the data set.
REPORTING_UNITS	VARCHAR2(20)	FIMAD.ANYL	The unit of measure in which the sample value is reported, as reported by the analytical laboratory.
REQUEST_NUM	VARCHAR2(20)	FIMAD.ANYL	An identifier assigned by LANL used to designate a group of samples submitted at the same time, to the analytical lab, for analysis.
RESULT_CHAR	VARCHAR2(10)	FIMAD.ANYL	A symbol that may precede a sample value, or a non-numeric analytical result, as reported by the analytical laboratory.
RFI_CLASS	VARCHAR2(20)	FIMAD.ANYL	An identifier assigned by LANL used for gross grouping of analytical data by "RAD", "ORGANIC", and "INORGANIC".
SAMPLE_ID	VARCHAR2(50)	DATADM.SAMPLE_HDR	The unique sample identifier assigned by LANL specification. The SAMPLE_ID has different formats depending on the LANL sampling organization that was responsible for collection of the sample.
SAMPLE_TYPE_CODE	VARCHAR2(20)	FIMAD.ANYL	A code associated with a type of sample for which analytical results are reported, as reported by the analytical laboratory.
SAMPLE_USG_CODE	VARCHAR2(10)	DATADM.SAMPLE_HDR	Indicates the purpose for which a sample was obtained and analyzed. See LUT_SAMPLE_USG for a list of codes.

FIELD NAME	DATA TYPE	SOURCE DATABASE TABLE	DICTIONARY DESCRIPTION
SAMPLE_USG_CODE_QC	VARCHAR2(6)	DATADM.SAMPLE_QC_CONTROL	A value that represents the current quality status of the SAMPLE_USG_CODE, based on global database quality checks. See LUT_SAMPLE_QC_CODE for a list of possible values.
SAMPLE_VALUE	NUMBER	FIMAD.ANYL	The reportable result for the analyte, as received from the analytical laboratory. (This field maps to RESULT in FIMAD.ANYL.)
SEQ_NUM	VARCHAR2(20)	FIMAD.ANYL	A unique sequence number that provides a primary key for the FIMAD.ANYL database table.
SHIPPING_DATE	DATE	FIMAD.SMO_REQUEST_MASTER	The date the sample was shipped to the analytical laboratory.
STD_REPORTING_UNITS	VARCHAR2(20)	FIMAD.ANYL	The standard unit of measure assigned by LANL calculated based on an algorithm chosen by the apparent appropriateness of the unit for the matrix and analyte for the record.
STD_SAMPLE_VALUE	NUMBER	FIMAD.ANYL	A value obtained by LANL by performing calculations on the result reported by the analytical laboratory to convert the value from the reporting units to standardized units, to allow comparison of analytical records using a standard unit of measure. (This field maps to STD_RESULT in FIMAD.ANYL.)
STD_UNCERTAINTY	NUMBER	FIMAD.ANYL	A value obtained by LANL by performing calculations on the uncertainty reported by the analytical laboratory to convert the value from the reporting units to standardized units, to allow comparison of analytical records using a standard unit of measure.
SUITE_NAME	VARCHAR2(50)	FIMAD.ANYL	A value assigned by LANL that indicates the analytical suite that the analytical record is associated with.
TECHNIQUE_CODE	VARCHAR2(50)	FIMAD.ANYL	Indicates the technique used to analyze the sample, as reported by the analytical laboratory.
UNCERTAINTY	NUMBER	FIMAD.ANYL	The uncertainty associated with the sample value, as reported by the analytical laboratory. For radionuclide results received since April 1995, the uncertainty value is the 1-sigma total propagated uncertainty associated with the measurement.

Quality Control Analytes

Analytical Class	Analytical Suite	Analytical Method	Analyte Type	Analyte(s)	Method Target Analytes?
Organic	Herbicides	SW-846 EPA Method 8151A	Surrogate	2,4-Dichlorophenylacetic acid (DCAA)	N
Organic	High Explosives	SW-846 EPA Method 8330	Surrogate	1,4-Dinitrobenzene	N
Organic	PCBs	SW-846 EPA Method 8081A	Surrogate	Decachlorobiphenyl (DCB) 2,4,5,6-Tetrachloro-m-xylene	N
Organic	Pesticides/PCBs	SW-846 EPA Method 8081A; SW-846 EPA Method 8082	Surrogate	Decachlorobiphenyl (DCB) 2,4,5,6-Tetrachloro-m-xylene	N
Organic	Pesticides	SW-846 EPA Method 8081A	Matrix Spike	Lindane Heptachlor Aldrin Dieldrin Endrin 4,4-DDT	Y
Organic	Semivolatile Organic Compounds	SW-846 EPA Method 8270C	Surrogate	Nitrobenzene-d5 2-Fluorobiphenyl p-Terphenyl-d14 Phenol-d6 2-Fluorophenol 2,4,6-Tribromophenol 2-Chlorophenol-d4 1,2-Dichlorobenzene-d4	N

Analytical Class	Analytical Suite	Analytical Method	Analyte Type	Analyte(s)	Method Target Analytes?
Organic	Semivolatile Organic Compounds	SW-846 EPA Method 8270C	Internal Standard	1,4-Dichlorobenzene-d4 Naphthalene-d8 Acenaphthene-d10 Phenanthrene-d10 Chrysene-d12 Perylene-d12	N
Organic	Semivolatile Organic Compounds	SW-846 EPA Method 8270C	Matrix Spike	Phenol 2-Chlorophenol 1,4-Dichlorobenzene N-Nitroso-di-n-propylamine 1,2,4-Trichlorobenzene 4-Chloro-3-methylphenol Acenaphthene 4-Nitrophenol 2,4-Dinitrotoluene Pentachlorophenol Pyrene	Y
Organic	Volatile Organic Compounds	SW-846 EPA Method 8260C	Surrogate	4-Bromofluorobenzene Dibromofluoromethane Toluene-d8 1,2-Dichloroethane-d4	N
Organic	Volatile Organic Compounds	SW-846 EPA Method 8260C	Internal Standard	Fluorobenzene, Chlorobenzene-d5 1,4-Dichlorobenzene-d4 Bromochloromethane 1,4-Difluorobenzene	N

Analytical Class	Analytical Suite	Analytical Method	Analyte Type	Analyte(s)	Method Target Analytes?
Organic	Volatile Organic Compounds	SW-846 EPA Method 8260C	Matrix Spike Analyte	1,1-Dichloroethane Trichloroethene Benzene Toluene Chlorobenzene	Y
Radionuclides	Isotopic Uranium	Chemical Separation/Alpha Spectroscopy	Tracer	Uranium-232	N
Radionuclides	Isotopic Plutonium	Chemical Separation/Alpha Spectroscopy	Tracer	Plutonium-242	N
Radionuclides	Americium-241	Chemical Separation/Alpha Spectroscopy	Tracer	Americium-243	N

Evaluation of Reanalyzed and Diluted Sample Results

Reanalyzed Samples

For the analyses of organic analytes, when the recoveries for surrogates are not within the required specifications, analytical laboratories will often reanalyze the sample extract to determine if these low recoveries can be attributed to the effects of the sample matrix. These reanalyses are referred to as sample "revals". The original sample results and the reval results are both reported in the electronic data deliverable (EDD). Sample revals are indicated by a SAMPLE_TYPE_CODE of "REVAL". For the generation of Frequency of Detect (FD) Tables, samples with revals are handled as follows:

Dependencies:
1. The standard STD_SAMPLE_VALUE and STD_UNITS field must be converted to mg/kg (soil) or ug/L (water).
2. The final qualifier (RFI_QUAL) field must be completed.

Algorithm:
1. If both the sample and the reval are not detected, the sample is retained and the reval is moved.
2. If both the sample and the reval are detected, the analysis with the largest STD_SAMPLE_VALUE is retained and the other is moved.
3. If both the sample and the reval are detected and the STD_SAMPLE_VALUE are equal, the reval is removed.
4. If the sample is detected and the reval is not detected, or vice versa, the detected analysis is retained and the not-detected analysis is moved.
5. Records are moved to the SAMPLES_WITH_REVALS table.

This procedure avoids duplication in the FD Tables and ensures that for each sample, target analytes the highest concentration will be carried forward in the FD Tables.

Diluted Samples

When analytes are detected at concentrations greater than the highest concentration on the initial calibration (ICAL) verification, samples must be diluted to bring the analyte concentrations within the range of the ICAL. When this occurs, the analytical laboratories report the undiluted analysis as well as all the dilutions in the EDD. For the generation of FD tables, samples with dilutions are handled as follows:

Dependencies:
1. The standard STD_SAMPLE_VALUE and STD_UNITS field must be converted to mg/kg (soil) or ug/L (water).
2. The final qualifier (RFI_QUAL) field must be completed.

Algorithm:
1. If the sample and its dilutions are not detected, the analysis with the smallest dilution factor is retained and the other analyses are moved.
2. If any of the analyses were detected for a sample and its dilutions, the analysis with the largest dilution factor is retained and the other analyses are moved.
3. Records are moved to the SAMPLES_WITH_DLS table.

Example Excel Output File in Frequency of Detect Format (for Soils and Sediments)

Analyte	Media Code	Number of Analyses	Number of Detects	Minimum of Detects mg/kg)	Mean of Detects (mg/kg)	Maximum of Detects (mg/kg)	Soil Background Value (mg/kg)	Frequency of Detects >Background Value
Aluminum	ALLH	46	46	1800	6300	97000	29200	1/46
Antimony	ALLH	46	2	13.6	14.7	15.8	0.83	2/46
Arsenic	ALLH	46	14	0.75	40	520	8.17	1/46
Barium	ALLH	46	41	40	90	200	295	0/46
Beryllium	ALLH	46	39	1.2	8.9	101	1.83	32/46
Cadmium	ALLH	46	2	1.1	1.15	1.2	0.4	2/46
Calcium	ALLH	46	46	530	2500	14000	6120	1/46
Chromium, total	ALLH	46	43	2.5	28	370	19.3	5/46
Cobalt	ALLH	46	4	5.4	6.0	6.4	8.64	0/46
Copper	ALLH	46	44	5.5	1000	7200	14.7	42/46
Iron	ALLH	46	46	2610	6850	14400	21500	0/46
Lead	ALLH	46	46	6.1	3070	132000	22.3	36/46
Magnesium	ALLH	46	46	371	926	3140	4610	0/46
Manganese	ALLH	46	46	64.6	195	604	671	0/46
Mercury	ALLH	46	2	0.11	0.14	0.17	0.1	2/46
Nickel	ALLH	46	10	9.2	39	188	15.4	4/46
Potassium	ALLH	46	46	260	630	1760	3460	0/46
Selenium	ALLH	46	1	0.63	0.63	0.63	1.52	0/46
Silver	ALLH	46	8	2.3	4.5	9.1	1	8/46
Sodium	ALLH	46	3	120	460	1130	915	1/46
Thallium	ALLH	46	0	—	—	—	0.73	0/46
Uranium	ALLH	46	42	2.6	1400	45000	1.82	42/46
Vanadium	ALLH	46	37	4.5	9.3	18.2	39.6	0/46
Zinc	ALLH	46	46	12.3	123	2860	48.8	17/46